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CCITT

THE INTERNATIONAL
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CONSULTATIVE COMMITTEE

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SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Testing equipments

Transmission media characteristics

Optical fibre cables

**Characteristics of a 1550 nm wavelength loss-
minimized single-mode optical fibre cable**

Reedition of CCITT Recommendation G.654 published in
the Blue Book, Fascicle III.3 (1988)

NOTES

1 CCITT Recommendation G.654 was published in Fascicle III.3 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation G.654

CHARACTERISTICS OF A 1550 nm WAVELENGTH LOSS-MINIMIZED SINGLE-MODE OPTICAL FIBRE CABLE

(Melbourne, 1988)

The CCITT,

considering

- (a) that very low loss fibres are required in some telecommunication network applications;
- (b) that the foreseen potential applications may require several kinds of single-mode fibres differing in:
 - geometrical characteristics;
 - operation wavelength;
 - attenuation, dispersion and other optical characteristics,
- (c) that Recommendations on different kinds of single-mode fibres can be prepared when practical use studies have sufficiently progressed,

recommends

a single-mode fibre which has the zero dispersion wavelength in the 1300 nm wavelength region, which is loss minimized at a wavelength around 1550 nm and which is designed for use in this region.

The geometrical, optical and transmission characteristics of this fibre are described below.

The meaning of the terms used in this Recommendation are given in Annex A, and the guidelines to be followed in the measurements to verify the various characteristics are indicated in Annex B.

Note – The characteristics of this fibre and the relevant values will be refined as studies and experience progress.

1 Fibre characteristics

1.1 Mode field diameter

The nominal value of the mode field diameter at 1550 nm shall be xx μm . The mode field diameter deviation should not exceed the limits of $\pm 10\%$ of the nominal value.

Note – The value for xx has to be specified. A value of 10.5 for xx is one possibility.

1.2 Cladding diameter

The recommended nominal value of the cladding diameter is 125 μm . The cladding deviation should not exceed the limits of $\pm 2.4\%$ ¹⁾ ($\pm 3 \mu\text{m}$).

1.3 Mode field concentricity error

The recommended mode field concentricity error at 1550 nm should not exceed 1 μm ¹⁾.

1.4 Non-circularity

1.4.1 Mode field non-circularity

In practice, the mode field non-circularity of fibres having nominally circular mode fields is found to be sufficiently low that propagation and jointing are not affected. It is therefore not considered necessary to recommend a particular value for the mode field non-circularity. It is not normally necessary to measure the mode field non-circularity for acceptance purposes.

¹⁾ Under study.

1.4.2 *Cladding non-circularity*

The cladding non-circularity should be less than 2%. For some particular jointing techniques and joint loss requirements, other tolerances may be appropriate.

1.5 *Cut-off wavelength*

The cut-off wavelength values shall be between xxxx nm and yyyy nm for λ_c , and smaller than zzzz nm for λ_{cc} .

Note – The values for xxxx, yyyy and zzzz have to be specified; values of 1350 for xxxx, 1600 for yyyy and 1530 for zzzz are one possibility.

1.6 *1550 nm bend loss performance*

Under study.

Note – The performance of this fibre should not be worse than fibre designed to meet Recommendation G.653.

1.7 *Material properties of the fibre*

This is given in § 1.7 of Recommendation G.652.

1.8 *Example of fibre design guidelines*

Supplement No. 33 gives an example of fibre design guidelines for matched cladding fibres used by one organization.

2 Factory length specifications

2.1 *Attenuation coefficient*

Optical fibre cables covered by this Recommendation shall have attenuation coefficients in the 1550 nm region ²⁾.

Note – The lowest values depend on fabrication process, fibre composition and design, and cables design. Values of 0.15 to 0.20 dB/km in the 1550 nm region have been achieved.

2.2 *Chromatic dispersion coefficient*

The maximum chromatic dispersion coefficient in the 1550 nm wavelength region of single-mode fibres covered in this Recommendation shall be 20 ps/(nm . km).

3 Elementary cable sections

As given in § 3 of Recommendation G.652.

²⁾ Under study.

ANNEX A

(to Recommendation G.654)

Meaning of the terms used in the Recommendation

Most of the definitions contained in Annex A to Recommendation G.652 are in principle applicable also to loss-minimized fibre. Because of limited experience with this type of fibre, further study of the suitability of some definitions is needed.

ANNEX B

(to Recommendation G.654)

Test methods for loss-minimized single-mode fibres

The present experience on loss-minimized single-mode fibres is rather limited; therefore further study is needed on some Reference and Alternative Test Methods for this type of fibre. Nevertheless, most of the test methods described in Annex B to Recommendation G.652 are in principle applicable also to loss-minimized fibres. Therefore, for this Annex, reference is made to the corresponding Test Methods of Annex B in Recommendation G.652; the specifics of each test procedure need further study. It should be noted that the working wavelength for G.654 fibres is in the 1550 nm region.

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